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Evaluation of Resource Recovery Opportunities for Mobile, Alabama

CSI Resource Systems, Inc.
Boston, MA

Prepared for

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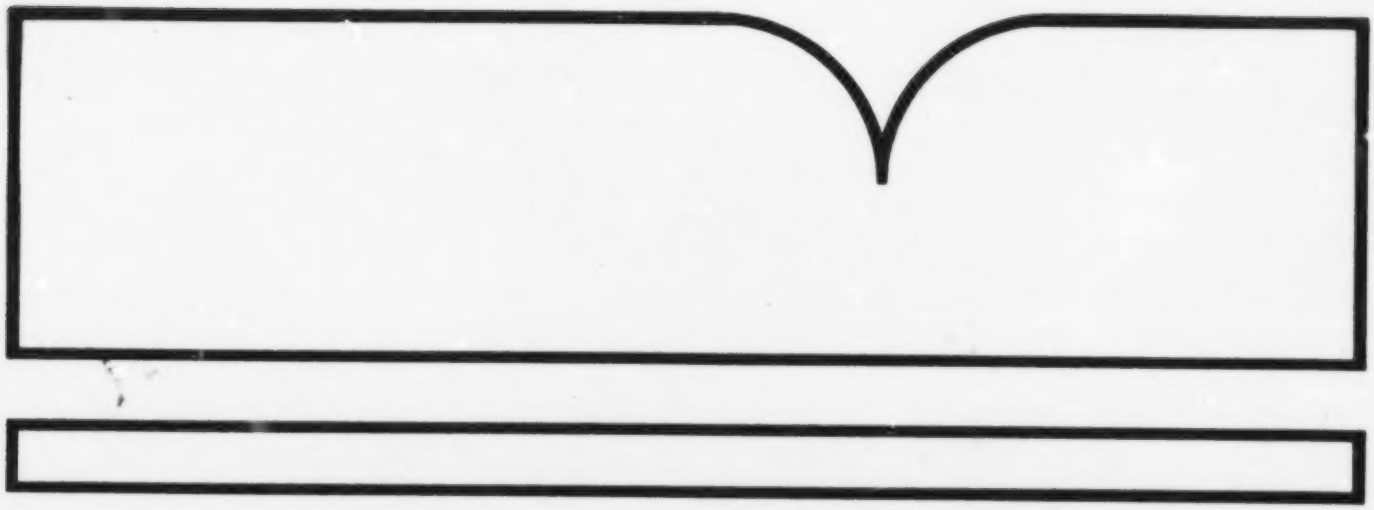

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This report focuses on technical assistance to the City of Mobile in establishing the feasibility of resource recovery. The study reviews the City and County's collection and disposal systems, surveys the industrial and institutional energy users, reviews existing technologies, develops a preliminary system definition with "first order" economics for a Mobile project and assist the City in legal/institutional concerns. A modular/waste heat boiler system with a discrete fossil-fuel-fired superheater with a throughput of 250 TPD_7 is recommended in order to product turbine-quality steam. (50,000 pounds per hour, 24 hours per day, 365 days per year)

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Evaluation of Resource Recovery Opportunities for Mobile, Alabama

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RESOURCE RECOVERY AND CONSERVATION PANELS

SEC. 2003. The Administrator shall provide teams of personnel, including Federal, State, and local employees or contractors (hereinafter referred to as "Resource Conservation and Recovery Panels") to provide States and local governments upon request with technical assistance on solid waste management, resource recovery, and resource conservation. Such teams shall include technical, marketing, financial, and institutional specialists, and the services of such teams shall be provided without charge to States or local governments.

This report has been reviewed by the Project Officer, EPA, and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Environmental Protection Agency, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

Project Officer: Elmer G. Cleveland

EVALUATION OF RESOURCE RECOVERY OPPORTUNITIES FOR MOBILE, ALABAMA

PREPARED FOR
OFFICE OF SOLID WASTE MANAGEMENT
U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION IV

BY

CSI RESOURCE SYSTEMS, INC.

OCTOBER 1981

PREFACE

This report was prepared for the City of Mobile, Alabama, under the Technical Assistance and Panels Program, which is conducted by the U.S. Environmental Protection Agency (EPA) to provide assistance to state and local governments. Technical assistance was provided in response to a request submitted to U.S. EPA Region IV by the City of Mobile.

The report presents the results of a preliminary determination of the feasibility of recovering energy from solid waste produced by the City and the surrounding area of Mobile County. This determination involved development for first-order estimates of the quantity of waste generated by the City and the County; evaluation of the market potential for energy recovery; development and evaluation of resource recovery alternatives; and identification of the major tasks to be performed prior to deciding to implement a resource recovery project. These activities reflect the results of several site visits to Mobile by CSI Resource Systems, Inc., and interviews with personnel from the City, the County, and the state; several industrial energy users in the area; and several firms in the solid waste management industry. CSI's efforts were supplemented by a local engineering firm working for the City, Mikell Speaks & Associates.

CSI is a technical assistance contractor to the Office of Solid and Hazardous Waste, U.S. EPA Region IV. Under the terms of the Technical Assistance and Panels Program, all of CSI's technical assistance activities on behalf of Mobile were paid for by EPA.

CSI wishes to thank especially the following individuals for their support and generous cooperation: Lambert Mims, Commissioner of Public Works, City of Mobile; Roy Howard, of Mobile County; Dr. Sven Peter Mannsfeld, President of Degussa Corporation, Alabama Group; and Mr. Sherman Douglas, President, and other principles of TBS, Inc.

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CHAPTER 1.
OVERVIEW

The City of Mobile, Alabama, is an urban port of around 200,000 people, located on the Gulf of Mexico. The Mobile area is experiencing strong growth in both population and business activity. The current population of Mobile County, including the City, is about 365,000.

In 1980, the City received a suggestion from one of the major industries in the area, the Degussa Corporation, that the City investigate the possibility of recovering energy in the form of steam from its solid waste for sale to Degussa. This suggestion coupled with the City's current high cost of hauling/disposal led to a request for technical assistance from the U.S. Environmental Protection Agency (EPA) to evaluate the feasibility of resource recovery as a solid waste management alternative. Subsequent to the technical assistance request, the City received a proposal from TBS, Inc., to process the City's municipally collected waste, supplemented by other waste streams in the County, in a TBS-owned resource recovery plant. This plant would produce steam for sale to Degussa.

This feasibility study had two overall objectives: first, to make a preliminary assessment of the feasibility of resource recovery in the Mobile area; and second, if the findings are positive, to assist the City in evaluating the TBS proposal in terms of a TBS-owned facility versus either the City or a specially created public authority sponsoring, and perhaps owning, a project on its own.

The feasibility of resource recovery depends on the presence of five basic ingredients:

- Potentially viable energy buyers whose requirements would use all or most of the usable, or processible, solid waste generated.*
- A sufficient tonnage of processible solid waste from which enough energy and/or salable materials could be produced

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* Processible solid waste is that tonnage of the total waste potentially available which could be processed in a resource recovery facility. Unprocessible materials include oversized, bulky waste (e.g., large metal objects, bed springs, rugs) and white goods.

to meet the requirements of one or more potentially viable buyers.

- Potentially viable sites that are well situated with respect to the shipment of solid waste and the delivery of energy to prospective buyers.
- Commercially available technologies that can reliably process available solid waste and produce energy and/or salable materials in the form, quality, and quantity required by prospective buyers.
- A net disposal cost that is competitive with available alternative disposal methods.

To assist the City of Mobile in establishing the feasibility of resource recovery, the study initially focused on a review of the City's and County's existing collection and disposal systems, in order to develop a preliminary estimate of the amount of waste potentially available for processing in a resource recovery facility and to establish the remaining useful lives of the area's landfills.

The large industrial and institutional energy users in the area were then surveyed by telephone, and personal visits were made to determine whether viable markets for energy derived from solid waste existed and whether nearby sites were available.

Existing technologies were then reviewed to reach a preliminary system definition for a Mobile project. Preliminary or "first-order" economics were projected for the most attractive market site/technology combination available to Mobile. The remainder of the study concentrated on assisting the City in comparing the economic and legal/institutional advantages and/or disadvantages of accepting TBS's waste disposal service contract with those of sponsoring and developing a project on its own or via a specially created authority.

In the remainder of this chapter, the study findings and conclusions are summarized. Chapters 2 through 6 present the study findings in more detail. Chapter 7 discusses next steps.

FINDINGS/CONCLUSIONS

The findings of the prefeasibility study indicate that a resource recovery system serving the Mobile area appears to be technically feasible and economically competitive with landfilling. The proposal from TBS has the potential of being at least as promising as a publicly sponsored project if a number of conditions related to the ultimate success of the project are met, and may be more advantageous in terms of facilitating implementation and limiting the size of the bond issue. Potential disadvantages include the lack of the City control of the project and the possibility that it may lose the opportunity to implement a project on its own, should the TBS project fail. These conclusions are based on the following:

- The City of Mobile and Mobile County have sufficient tonnage of waste available (some 380 TPD_7* or 138,700 tons per year) to support a small-scale resource recovery facility.

- While the existing City landfill has an estimated remaining life of 12 to 15 years exclusive of the possibility for expansion, the major County landfill is facing immediate closure.

- The City's 1980 disposal cost for municipally collected waste was around $14.00 per ton (including transfer and hauling).

- The Degussa Corporation plant located in the Theodore Industrial Park south of the City of Mobile represents a technically and economically attractive potential buyer of waste-derived turbine-quality steam. In addition, Degussa has indicated a willingness to purchase waste-derived steam as evidenced by the steam sales agreement that it has negotiated with TBS. Finally, undeveloped land close to the plant is potentially available for use as a resource-recovery plant site.

- A modular pre-assembled system with a throughput capacity of at least 250 TPD_7 could be used to raise steam, which could then be superheated in a discrete superheater to meet the steam conditions of Degussa.

- Assuming a financing plan that combines equity contribution and revenue bonds, a publicly sponsored

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* Tons per day on a 7-day-per-week, 365-day-per-year basis.

system appears to be competitive with the cost of continuing landfilling a few years after startup and can be reasonably competitive with the TBS proposal, depending on the eventual price and escalation formula agreed to. On a life-cycle cost basis, a publicly sponsored project using 100-percent revenue bond financing also appears to be competitive with continued landfilling.

- Private sponsorship/ownership may be more attractive to the City for the following reasons:

  - As a public entity, the City faces legal institutional constraints that could delay or preclude a successful project implementation. These constraints could be somewhat mitigated by creating a special resource recovery authority.

  - Revenue bond issue, if required, would be much smaller.

NEXT STEPS

If the City wishes to proceed with the TBS proposal, it should take all due precautions to ensure that the following conditions for a successful TBS-sponsored project exist:

- that the Steam Sales Agreement with Degussa is fair and binding
- that all Waste Supply Agreements are fair and binding
- that the system Supply and Operations Agreement between TBS and vendor/operator is technically feasible, reasonably allocates risks between the parties, and is binding
- that a reasonable and feasible financing plan is or will be implemented
- that TBS has firm commitments for landfill capacity for residues, unprocessibles, and bypassed wastes
- that TBS will comply with all relevant regulatory requirements
- that TBS is developing the project in a timely and cost-effective manner.

CHAPTER 2.
SOLID WASTE COLLECTION, DISPOSAL, AND GENERATION

The attractiveness and feasibility of resource recovery for Mobile City and County depends in part on the magnitude of the area's solid waste disposal problem, the amount of waste that is potentially available for processing, and the economics of resource recovery as compared with continued primary reliance on landfilling. Therefore, an early task in this study involved identifying and quantifying waste streams throughout Mobile County; obtaining estimates of the expected life of existing disposal facilities; and obtaining estimates of the cost of current disposal practices.

This task indicated the following:

- Approximately 55 percent of the waste generated in the area is collected by municipal vehicles; the balance is collected by private haulers.
- An estimated total of 380 TPD_7 of waste (exclusive of trash) are currently generated in the Mobile area; of this amount, it was assumed that 250 to 300 TPD_7 would be available for processing in a resource recovery facility.*
- The County-owned Irvington landfill, where some 45 percent of the area's waste is currently delivered, is due to close within the year; the City-owned Chastang landfill has at least 12 to 15 more years of life.
- Landfill disposal costs, including transfer/haul costs, to the City of Mobile were approximately $14.00 per ton in 1980. Current tip fees charged by the County to the two major private haulers operating in the area are around $6.00 per ton.

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* It should be noted that neither a weighing nor sorting/sampling program has been conducted for the Mobile area waste. A weighing program is necessary to refine the waste generation estimates for purposes of developing a waste acquisition strategy. A sorting/sampling program is necessary to obtain waste composition data, as well as to determine waste chemistry. Knowledge of the specific chemistry of the waste in the Mobile area is essential for predicting system performance (e.g., steam output, quantity of residue per input ton of waste).

CURRENT COLLECTION AND DISPOSAL PRACTICES

Current collection and disposal practices are summarized in the following subsections for the City of Mobile and the surrounding Mobile County.

City of Mobile

The City of Mobile provides municipal collection services for residents. Residential solid waste is delivered to the City's transfer station on McDuffie Island in Mobile Bay and then hauled to the City-owned and operated Chastang landfill in the community of Bucks, which is north of the City along Route 43. The City is currently searching for a new site for a transfer station because of land-use and access problems with the McDuffie Island station.

The City also collects trash, including trees, brush, demolition materials, and other bulky wastes, most of which are not suitable for processing in a resource recovery operation. This material is disposed of at the Bates landfill, located just west of the City near the Mobile airport.

Commercial and industrial wastes from the City are collected by private haulers under contract to individual businesses. The two major haulers operating in the City are SCA Services and Browning Ferris Industries (BFI). These wastes are delivered to the Irvington landfill, which is owned and operated by Mobile County.

Remainder of Mobile County

With the exception of the two incorporated areas of Prichard and Saraland, both residential and commercial wastes are collected by private haulers under contract to individual residences and businesses. SCA and BFI are again the two major private haulers operating in the area. The City of Prichard provides municipal collection services to both residences and commercial establishments and delivers this waste to the County-owned Chunchula landfill. The City of Saraland collects its residential and commercial wastes and disposes of them at its own landfill located on Celeste Road west of Saraland.

CURRENT GENERATION

Waste generation estimates for the City's residential waste were obtained from personnel at the City's Department of Public Works. SCA and BFI personnel provided volume estimates for the wastes they collect in the City and the County. These volume estimates were then translated into tonnage estimates based on conversion factors provided by these two haulers. Information on waste generation in Prichard and Saraland was obtained from respective municipal personnel.

These waste generation estimates (totaling 383 TPD_7) are given in Table 2.1 by source. This table also indicates the destination of this waste.

LANDFILL CAPACITY

The City estimates there are about 12 to 15 years of remaining life at the Chastang landfill and has indicated that the facility may be expanded when necessary.

The County-owned Irvington landfill, which is currently the disposal site for some 45 percent of the area's waste, is under orders from the Alabama Department of Public Health to shut down within the year. County officials are now searching for a site to replace it and are encountering some difficulty. The Chunchula landfill is new and could have a remaining life of 15 years or greater, depending on increases in the daily waste input.

DISPOSAL COSTS

Records on the per-ton operating costs of the municipal residential collection services were obtained from the City. In 1980, these operating costs were:

Transfer Stational Operation	$ 4.28 per ton
Haul to Landfill (Private Contract)	3.32 per ton
Landfill Operations	6.05 per ton
TOTAL	$13.65 per ton

TABLE 2.1

SUMMARY OF WASTE GENERATION
AND DISPOSAL IN THE MOBILE AREA*

SOURCE	HAULER	LANDFILL (owner/name)	TONS PER WEEK	TPD_7
City Residential	City	City/Chastang	1,100	157
City Commercial and County	SCA & BFI	County/Irvington	550 650	79 93
Prichard	Prichard	County/Chunchula	300	43
Saraland	Saraland	Saraland/Celeste Road	80	11
TOTAL			2,680	383

Mobile County disposal costs were not identified, but one measure of cost would be the tip fees charged to private haulers. These fees were around $6.00 per ton in 1981.

* Waste generation estimates do not include trash (e.g., trees, brush, demolition materials), which is unsuitable for processing in a resource recovery facility. The City collects approximately 1,000 tons per week of trash and SCA, about 200 tons per week.

CHAPTER 3.
MARKET INVESTIGATION

From the TBS proposal, it was already known that Degussa Corporation located in the Theodore Industrial Park is a potential customer for waste-derived steam. Information from Greater Mobile Chamber of Commerce indicated that a number of other companies could be possible energy users. Thirteen additional industries were contacted by telephone to determine if their energy consumption practices appeared to be compatible with resource recovery and to ascertain their interest in the concept. On the basis of this initial telephone survey, the following four firms, including Degussa, were selected for personal visits to obtain more detailed information:

- Degussa Corporation
- International Paper
- Alabama Power
- Union Carbide.

After narrowing the list of prospective buyers down to four, each potential market was assessed according to the following:

- Technical capability to use recovered energy
- Continuity of operations
- Current use of high-cost fuel
- Availability of or proximity to a suitable site for an energy recovery facility
- Proximity to the centroid of the wasteshed
- Stability as a long-term energy buyer
- Interest in participating in a resource recovery project.

The economic viability of resource recovery depends, to a great extent, on the revenues from the sale of the energy product(s). The price that can be obtained for waste-derived energy is, in turn, dependent on the price of the fuel it will be displacing. Energy-from-waste products

include steam; high-temperature, low-Btu gas; electricity; and refuse-derived fuel (RDF). In the case of a Mobile resource recovery system, buyers of electricity would be less desirable than buyers of other products, because electricity-only production from a system less than 1,000 TPD in size is typically not as cost-effective as thermal energy production. RDF can be produced for sale to customers who would then cofire the RDF with coal in their own boilers or for use in a new dedicated boiler either on- or off-site to raise thermal energy.

The most desirable steam and high-temperature gas customers would have a relatively constant demand on a continuous basis. For steam customers, sites can be located within a 1-to-2-mile radius; for buyers of high-temperature gas, site proximity is more critical. Given that the resource recovery plant must be in close proximity to both steam and high-temperature gas customers, these customers should be located close to the centroid of the wasteshed being served. Site location is less of an issue for RDF customers; such customers must, however, be within an economic hauling distance of the resource recovery facility. For electricity customers, proximity to the customer is not an issue, as tie-in to the electrical grid can occur at virtually any point.

On the basis of these desired characteristics and the amount of processible waste potentially available in the Mobile area, the market survey indicated that Degussa is the most attractive energy customer. This finding confirms the selection of Degussa by TBS as the customer for its proposed project.

Each potential customer investigated is described in greater detail in the remainder of this chapter.

DEGUSSA CORPORATION

Degussa Corporation is a subsidiary of a large West German metals and chemicals firm of the same name. In 1978, Degussa's largest American plant--a $146-million chemical manufacturing complex in the Theodore Industrial Park--went on line.

Degussa currently uses natural gas, on both a firm and interruptible basis, to raise 325-psi steam superheated to 700°F. Residual oil is used

as a backup fuel. Current steam demand is relatively constant at around 80,000 pounds per hour; this demand is expected to grow. Plant operations are 24 hours per day, 7 days per week, year round.

To produce 80,000 pounds of steam per hour would require around 400 TPD_7 of solid waste. As less than 400 TPD_7 is generated in the Mobile area, the Degussa steam market is of a size to recover all of the energy available from the waste. The fuel that would be displaced is natural gas, which will be fully deregulated by 1985 such that it will be price-competitive with oil. There is vacant land in Theodore Industrial Park for a potential plant site less than a mile from the Degussa plant. This site has reasonably good access from major highways leading from Mobile and population centers of the surrounding County.

Degussa management's interest and confidence in the waste-to-energy concept is evidenced by the fact that it has negotiated a steam sales agreement with TBS, to be signed when the project financing is in place.

INTERNATIONAL PAPER

International Paper operates a large integrated paper mill just north of the Mobile City limits near the Mobile River. The plant produces a variety of paper, including food-packaging containers.

International Paper's steam demand is met via the following boilers:

NUMBER	DESCRIPTION	RATED CAPACITY (klb/hr)	FUEL
2	Power Boilers	450 (each)	Coal
1	Power Boiler	600	Bark
1	Recovery Boiler	250	Black Liquor
2	Recovery Boilers	130 (each)	Black Liquor

The three recovery boilers use the fuel value of black liquor, which is a by-product of pulpmaking; hence, they require no purchased fuels. The bark-fired power boiler uses wastes (hog fuel) from wood processing,

supplemented by readily available and inexpensive bark and additional hog fuel. The two coal-fired power boilers are used to supplement the larger bark-fired power boiler. High-pressure and high-temperature steam (1,800 psig, 1,000°F) from the power boilers is used to cogenerate electricity, with steam extracted for process applications.

Because the boilers are currently fired by relatively low-priced coal, relatively inexpensive waste fuels, and in-plant wastes, the sale of steam or high-temperature gas to International Paper would result in low energy revenues to the resource recovery project. Moreover, International Paper indicated that, based on its previous trial experience with burning RDF at its nearby Moss Point, Mississippi, plant, it would not be interested in purchasing RDF at this time.

ALABAMA POWER COMPANY

Alabama Power is a wholly owned subsidiary of The Southern Company, a utility holding company, and is the electric utility serving the Mobile area. Alabama Power was considered for its potential as either a primary market for steam or RDF or as a secondary market for cogenerated electricity. Alabama Power's closest power plant to Mobile--the Barry Steam Plant--is located about 25 miles north of the City on the Mobile River. The plant comprises several electrical generating units ranging from 235 MW to 800 MW in capacity. The plant's units are fired by coal.

Because of the concerns expressed by Alabama Power personnel regarding reliability and other technical issues, sale of RDF or high-temperature, low-Btu gas was eliminated.

Since refuse-fired plants are technically unable to raise steam to the temperatures and pressures required by modern utility steam turbines utilizing fossil-fuel combustion, sale of steam to Alabama Power was eliminated.

Selling electricity to Alabama Power as a primary market was not considered because of the low energy credits that are available to small generators because of the utility's heavy reliance on nuclear and coal-fired plants.

Alabama Power was also assessed as a secondary market for electricity from a cogeneration resource recovery plant. This concept involves using steam in excess of that which can be absorbed by the primary steam market to generate electricity. Cogenerated electricity is sold to a utility under the guidelines of the federal Public Utilities and Regulatory Policies Act (PURPA). According to PURPA guidelines, a utility must purchase power produced under rigid specifications by a facility that has been approved as a qualified facility. The utility must pay a price equal to its avoided cost (i.e., the cost the utility does not incur because of this purchase). Alabama Power's published rates for purchasing from qualified facilities under 100 MW in size range from 1.77 cents to 2.61 cents per kWh.

Because no viable customers were identified whose steam requirements would be less than the output of a resource recovery facility sized to process the amount of waste estimated to be available in the Mobile area, Alabama Power was eliminated as a possible secondary market for cogenerated electricity.

UNION CARBIDE

This large chemical manufacturer has a major facility just north of the City of Mobile, near the town of Chicksaw. The plant uses low-pressure, saturated steam for process applications that it raises in its natural-gas-fired boilers. Steam demand is continuous throughout the year, but fluctuates greatly on an hourly basis between 15,000 and 50,000 pounds per hour.

Union Carbide was eliminated from further consideration as a steam customer for the following reasons:

- Managers at this Union Carbide plant did not indicate a high level of interest in purchasing waste-derived energy.
- Hourly fluctuation in steam demand would require a resource recovery plant employing cogeneration; Union Carbide as a primary market would yield lower energy revenues than the Degussa market because total revenues from cogenerated electricity and steam would be less than revenues from straight-steam sales.

- Because of the location of Union Carbide, collection trucks would have to pass through a residential area to reach the resource recovery plant.

CHAPTER 4.
TECHNOLOGY ASSESSMENT

In this chapter, brief descriptions are given of available resource recovery technologies appropriate for the energy market and the estimated available waste, followed by a preliminary system definition for a waste-to-steam system to service Degussa and the Mobile waste generation area.

Commercially demonstrated, technically viable approaches for steam production from the Mobile area's waste include:

- Mass-burning systems employing the following technologies:
  - Modular (i.e., pre-engineered, typically pre-assembled) units with waste heat boilers*
  - Field-erected refractory furnaces with waste heat boilers
  - Field-erected waterwall furnaces with integral boilers.
- Field-erected coarse RDF production/dedicated furnaces with integral boilers.

In the case of mass-burning unit technology, only systems employing field-erected mass-burners have been actually operated to raise superheated steam at the temperature that would be required by Degussa. While some modular technologies may be capable of providing 700°F steam, this application has not yet been commercially proven. In the latter case, several solutions are possible: (1) supplementary use of fossil fuel to regulate flue gas temperature entering the boiler; or (2) a discrete fossil-fuel-fired superheater. TBS has proposed the latter solution. While it is not anticipated that this approach should present any technical problems, it should be noted that this concept has never been applied in an operating modular system. Discrete superheaters are in use in industrial applications, but not extensively.

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* Small-scale modular systems typically employ pre-assembled units.

From a capital cost point of view, a system using pre-engineered, pre-assembled mass-burning technology appears to be the most promising for Mobile/Degussa. A mass-burning field-erected system is typically more capital-intensive than is a modular system at the size range appropriate for the Mobile area (throughput of 250-300 TPD_7). Because Degussa does not have any coal-fired boilers, RDF/coal cofiring is precluded. If, for some reason, coarse RDF were desired, this approach would involve constructing a new dedicated boiler to burn the RDF and raise steam for Degussa. Since a coarse RDF production/dedicated boiler system is basically field-erected, it is likely to be more capital-intensive than a modular/waste heat boiler system that is preassembled.

The capital cost advantage of the modular system would likely be maintained even with the inclusion of a discrete superheater. Consequently, the preliminary system definition developed for purposes of economic analysis is based on modular/waste heat boiler technology.

As described above, a modular/waste heat boiler system with a discrete fossil-fuel-fired superheater would likely be the most practical system, given the amount of waste potentially available in the Mobile area and the energy requirements of Degussa. This system is defined below:

- Throughput - 250 TPD_7. This will consume most of the potentially available waste in the Mobile area and will not exceed the maximum steam commitment that Degussa is willing to give at this time (i.e., 50,000 pounds per hour, 24 hours per day, 365 days per year).

- Energy product - Turbine-quality steam.

- System capacity - No waste-to-energy unit can run continuously because of forced and scheduled outages. (Some of the modular combustion unit equipment available must be taken off line for one day every 7 to 10 days, plus 2 to 4 weeks per year for boiler inspections.) Typically, an extra unit or half unit representing about 20 percent of system throughput must be installed to provide a high availability (i.e., low percentage of emergency waste bypass) for continuous operation.

- System configuration - Individual units are available in a variety of sizes up to 150 TPD. Consequently, a

number of configurations are possible to allow a 250-300 TPD_7 throughput (e.g., three 100-TPD units, four 75-TPD units, six 50-TPD units).*

In defining this system for purposes of the preliminary economic analysis, the following technical assumptions were used:

- The higher heating value/energy content of the Mobile area's waste is 4,500 Btu per pound.
- System thermal energy is 60 percent.
- Design capacity is 300 TPD with a 3-day storage capacity at the plant. The size and, hence, number of units is not specified because first-order capital and operating costs would likely be similar for the various configurations possible.
- Steam is raised at 385 psig, 445°F, and then superheated in a discrete, fossil-fuel-fired superheater for delivery to Degussa at 325 psig, 700°F.
- Steam output is approximately 4,400 pounds per ton of waste with 100-percent condensate return at 50°F.
- System operation is 24 hours per day, 347 days per year.
- Average waste throughput is 250 TPD_7, or 86,700 tons per year.
- Residuals to landfill are 26,000 tons per year.

These assumptions are similar to those used in the TBS proposal.

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* In order to maintain the capital-cost advantage of pre-assembled units, individual unit size may be constrained to less than 100 TPD.

CHAPTER 5.
PRELIMINARY ECONOMIC ASSESSMENT

The economic feasibility of a resource recovery project may be determined by comparing the projected cost of that option with that of available alternative solid waste disposal options (i.e., continued primary reliance on landfilling).

The preliminary economic assessment of the system described in the previous chapter assumes that the City of Mobile or a specially created resource recovery authority would sponsor the system. In conducting this preliminary assessment, care was taken to use system assumptions similar to those used in the TBS proposal, to provide a basis for meaningful comparison. For this same reason, continued landfilling costs and the net disposal costs given in the TBS proposal were projected through 1989.

To reflect the fact that debt service requirements vary depending on the financing method used, cost projections were developed under two different financing scenarios: 100-percent revenue bond financing and 75-percent revenue bond/25-percent equity financing. General obligation bond financing was not considered on the premise that the City may wish to retain its remaining general obligation bonding capacity for other necessary municipal projects. Should the City create a resource recovery authority as permitted under state law, revenue bond financing would be required.

While to date both general obligation and revenue bonds have been the principal instruments used for financing resource recovery projects, equity investment (i.e., private ownership) is becoming more common because of the tax benefits it affords to the investor. Investment tax credits, accelerated depreciation methods, and shorter depreciation periods are incentives that have been federally legislated in the last several years. In addition, if taxable bonds are issued, the private owner can also realize a 10-percent energy tax credit. Projects can now realize substantial additional benefits through private-sector project ownership, in which private equity can reduce the amount of tax-exempt bonds that must be sold in the marketplace.

Preliminary economic analysis indicates that:

- From a life-cycle cost point of view, a publicly sponsored resource recovery project appears to be competitive with the projected haul/disposal cost of continued primary reliance on landfilling under either of the above-cited financing approaches.

- From an economic perspective, a project financing involving equity participation with or without revenue bond issue offers a substantially lower net disposal cost than a project financed through 100-percent revenue bond issue.

- On a life-cycle cost basis, the City could be indifferent as to which form of equity financing is involved:

  - The tip fee under the TBS proposal appears to be lower in the early years than that which would be realized under a revenue bond financing with a 25-percent equity contribution.

  - During the latter years of the project, the tip fee would become higher under the TBS proposal than under a revenue bond financing with equity participation.

Thus, it is concluded that the City should give favorable consideration to a project involving equity participation.

The remainder of this chapter summarizes the methodology and assumptions used, and presents the results for each financing alternative.

METHODOLOGY

To be considered economically feasible, a resource recovery project should offer Mobile City and County a net solid waste disposal cost that is competitive with the cost of continued primary reliance on landfilling. The net solid waste disposal cost is determined by subtracting annual project energy revenues from the combined annual capital and operating and maintenance costs associated with the resource recovery facility and with a backup landfill for residues, unprocessibles, and wastes that must bypass the facility.

To determine the economic feasibility of the two alternatives, the net disposal cost of each alternative was projected for 1984 and 1989, the assumed first and sixth years of facility operation. The year 1984 was selected as the first year of facility operation to reflect the lead time for design, construction, and startup of the resource recovery facility. Although life-cycle costing would have been an appropriate method fo economic evaluation, the hazards of projecting costs and revenue over the life of a facility (e.g., 17 years) resulted in a decision to limit projections to a 6-year period.

The assumptions used in developing the economic projections and the derivation of the major elements of the cost projections are summarized below.

Projected System Costs

Capital and annual operating and maintenance costs assumed that a full-service vendor would be responsible for system design, construction, startup, demonstration of system performance, and long-term operation of the facility. The 1981 capital costs of the two options evaluated were developed from engineering estimates and recent bids submitted by full-service vendors for comparably sized resource recovery systems. These costs were projected to 1983 (assumed to be the midpoint of construction) at an annual compounded rate of 10 percent for both the revenue and revenue bond/equity financing approaches. For both financing methods, energy and disposal fee revenues are the only source of payment for bondholders, who receive tax-exempt interest at a rate assumed to be 12 percent over a term of 17 years.

For revenue bond/equity financing, the 25-percent equity contribution enables reductions in the debt service reserve and capitalized interest accounts and reduces the total bond issue by approximately $1.50 for each dollar of equity invested.

The 17-year term of the bond issue includes 2 years of capitalized interest during the design/construction/startup/acceptance test period and 15 years of payment of interest and principal. A relatively short period of financing was chosen for two reasons: (1) to be consistent

with the time period offered by TBS for a waste disposal service; and (2) to reflect the current deterioration in the long-term bond market.

Projected Energy Revenues

In projecting the energy revenues for each alternative evaluated, it was assumed that waste-derived steam is priced according to the fuel (natural gas) value of 325-psig, 700°F, steam at an assumed boiler efficiency of 80 percent with a 100-percent condensate return, discounted at 20 percent. Annual escalation in natural gas prices is 10 percent, compounded; hence, steam revenues increase at the same price.

Projected Backup Landfill Costs

To reflect fully the costs of disposal under resource recovery, consideration has to be given to the ultimate disposal of unprocessible wastes, bypassed wastes, and residuals from combustion. For purposes of this preliminary analysis, it was assumed that the average per-ton cost of landfilling this quantity of waste in an environmentally complying disposal facility would be $14.00 in 1984, with a 10-percent annual escalation.

It was assumed that unprocessibles and bypassed waste amount to 5 percent of the total waste available, and residuals represent 25 percent of the input tonnage for a total of 30 percent.

Projected Costs of Continued Primary Reliance on Landfilling

The 1980 disposal cost to the City of Mobile for its residential waste was estimated at around $14.00 per ton in 1980 (including transfer and haul costs). However, to make a more meaningful comparison between the costs of continued landfilling and hauling to a resource recovery plant requires estimating the differential cost of hauling from a future transfer station site to the Chastang landfill.

On the basis of current information on possible transfer station sites, a resource recovery facility located in the vicinity of Degussa appears to have a one-way haul advantage to the Chastang landfill of from 5 to 10 miles. Assuming a differential haul distance between the

landfill and a new transfer station of 7 miles one way and a one-way haul cost of $0.25 per ton-mile (1980 dollars), hauling to the landfill from a new transfer station is estimated to cost $1.75 per ton more than going to a resource recovery facility located in the vicinity of Degussa. If this incremental haul cost is added to the 1980 estimated operating cost at the Chastang landfill of $6.00 per ton, the estimated 1980 cost of landfill disposal for purposes of comparison to resource recovery is $7.75 per ton. This 1980 per-ton cost is projected to 1981, 1984 and 1989, assuming an escalation factor of 10 percent per year. The results are presented in the following table:

PROJECTED OPERATING COSTS OF
CONTINUED LANDFILLING AND INCREMENTAL HAULING

Year	1981	1984	1989
Net Disposal Cost per Ton	$8.50	$11.40	$18.30

Projected Net Disposal Costs of the TBS Proposal

TBS in its proposal to the City has indicated it would provide a long-term disposal service for a base-year (1981) price of $4.60 per ton. The base-year price is to be adjusted annually according to year-to-year changes in several indices that TBS feels reflect changes in specific components of operating and maintenance costs, such as labor, fuel, and equipment maintenance.

Estimates of various components comprising base-year operating and maintenance costs and of annual debt service were submitted to the City by TBS. These estimates have not been subjected to a rigorous audit. Rather, they have been reviewed as to reasonableness based on: (1) review of firm price proposals made by vendors in response to Requests For Proposals issued for projects employing similar technology and design capacity to that proposed by TBS; and (2) limited discussions with several operators of small-scale projects.

Several observations are offered as a result of the review. First, at the time the estimates were prepared, TBS had not made a final

selection of a system supplier/operator. Final selection was completed as this report was being prepared. Results of discussions with TBS and its equipment vendor/operator suggest that some upward revision of individual cost components may have to be made in order to ensure the economic integrity of the project. Second, since the time of the TBS proposal, the market for long-term debt has seriously deteriorated and significantly higher interest rates are now required in order to attract buyers of such debt. If at the time of project financing, interest rates on capital are significantly higher than those assumed by TBS in developing its proposal, then the debt service component of total annual costs will be higher than estimated. If this occurs, some upward adjustment in the disposal price originally indicated by TBS may have to occur. Third, federal income tax benefits stemming from a 10-percent investment tax credit on plant and equipment and the ability to fully depreciate building and equipment at an accelerated rate over a short period of time (5-10 years) should shelter early-year profits from income taxes. These tax benefits may provide TBS with some flexibility in handling deviations from its original estimates of total annual costs.

After TBS reviews the effects of these cost factors, it may wish to adjust the price originally proposed. If TBS is able to offer the City a firm fixed base-year disposal cost reasonably less than that currently experienced, Mobile would benefit. To achieve savings in the cost of disposal, the City needs to negotiate an agreement on the price for the disposal service that will permit TBS to remain profitable over the 15-year contract period offered by the firm. To further reduce the cost of disposal, the City might wish to negotiate a share of any surplus project revenues. Surplus revenues represent those funds remaining after total annual costs have been met, including operating and maintenance, debt service, taxes, profits, and return on investment. Whether surplus revenues occur will depend upon the size of annual increases in natural gas or oil prices and the specifics of the steam sales agreement between TBS and Degussa.

For purposes of comparative analysis, the TBS base-year disposal price of $4.60 has been utilized. It has been assumed that the TBS cost per ton will escalate annually at a rate of 10 percent to be consistent

with the continued landfilling and publicly sponsored resource recovery options. Estimates of the escalated TBS proposed disposal charge are presented in the table below. The estimates are rounded off to the nearest 10 cents.

PROJECTED NET DISPOSAL COSTS OF TBS PROPOSAL

Year	1981	1984	1989
Net Disposal Cost per Ton	$4.60	$6.10	$9.80

Preliminary estimates of the net disposal costs for a publicly sponsored project assuming 100-percent revenue bond financing and for a project financed with 25-percent private equity and a revenue bond issue for the remaining 75 percent of the capital cost are shown in the following table. These estimates are rounded off to the nearest 10 cents. Details of these estimates are contained in Tables 5.1 and 5.2 at the end of this chapter.

PROJECTED NET DISPOSAL COSTS OF PUBLICLY SPONSORED PROJECT

Year	1984	1989
Net Disposal Cost per Ton (100% RB)	$18.40	$15.30
Net Disposal Cost per Ton (75% RB/25% Equity)	$12.80	$ 9.70

RESULTS

As highlighted at the beginning of this chapter, the results of the preliminary economic analysis indicate that a resource recovery project involving a combination of equity and revenue bond or one totally privately financed should result in lower costs to the City when compared to

continued reliance on landfilling as the principal means of disposal. While there appears to be early-year differences between the two forms of financing involving private ownerships of the project, these initial differences balance out over the life of the project. As a result, the City can be indifferent as to which form of private ownership financing is used. Because it can be indifferent, the City should have no objection to use of a revenue bond issue, if such should become necessary for a successful financing of the TBS project.

TABLE 5.1

PROJECTED ECONOMICS FOR 250-TPD$_7$
CITY-SPONSORED RESOURCE RECOVERY SYSTEM
(100% Revenue Bond Financing)

Annual Solid Waste Throughput (Tons) = 86,700

Annual Energy Sales (pounds of steam) = 382×10^6

EXPENSE ITEMS ($/ton)	Operating Year 1 (1984)	6 (1989)
Debt Service	$26.63	$26.63
O & M	17.01	27.39
Residual Disposal	5.59	9.00
Operator's Fee	3.99	6.43
SUBTOTAL	$53.22	$69.46
REVENUES ($/ton)		
Steam	$31.62	$50.92
Debt Service Reserve Earnings	3.20	3.20
SUBTOTAL	$34.82	$54.12
Required Tip Fee ($/ton)	**$18.40**	**$15.34**
Total Annual Tip Fee for 86,700 TPY ($000)	**$1,595**	**$1,330**

TABLE 5.2

PROJECTED ECONOMICS FOR 250-TPD$_7$
CITY-SPONSORED RESOURCE RECOVERY SYSTEM
(75% Revenue bond/25% Equity Financing)

Annual Solid Waste Throughput (Tons) = 86,700

Annual Energy Sales (pounds of steam) = 382×10^6

EXPENSE ITEMS ($/ton)	Operating Year	
	1 (1984	6 (1989)
Debt Service	$20.27	$20.27
O & M	17.01	27.39
Residual Disposal	5.59	9.00
Operator's Fee	3.99	6.43
SUBTOTAL	$46.86	$63.09
REVENUES ($/ton)		
Steam	$31.62	$50.92
Debt Service Reserve Earnings	2.43	2.43
SUBTOTAL	$34.05	$53.35
Required Tip Fee ($/ton)	$12.81	$ 9.74
Total Annual Tip Fee for 86,700 TPY ($000)	$1,110	$844

CHAPTER 6.
PROJECT IMPLEMENTATION

The results of the earlier tasks in this study conclude that resource recovery appears to be a technically feasible and economically viable solid waste management alternative for the City of Mobile. The necessary ingredients appear to be present:

- A technically suitable energy buyer has been identified and is willing to enter into a long-term energy purchase contract.
- A site to accommodate a plant and meet environmental standards has been identified and can be secured.
- An adequate and suitable waste supply is potentially available.
- An appropriate technology has been identified.
- Preliminary economic analysis indicates that the proposal from TBS, where TBS would own the facility, is less costly than a City-sponsored resource recovery system, but that both resource recovery approaches are less costly on a life-cycle costing basis than continued total reliance on landfilling.

The establishment of technical and economic feasibility, however, does not guarantee that a plant will ever be built and operate successfully. The fundamental decision required is whether or not to proceed with implementation of an energy recovery project. If the decision is to implement, then the City faces a further decision on how best to undertake such project implementation. The purpose of this chapter is to inform the City on key elements involved in successful implementation. The discussion of these key elements is structured around the underlying implementation decision facing the City: whether or not to negotiate with TBS for a long-term disposal service arrangement or to reject TBS and initiate sponsorship of the project with or without private ownership. (In cases where private equity financing is used to partially finance and/or stand behind the repayment of the bonds of a municipally sponsored project, ownership of the facility actually passes to the firm providing the equity. With such arrangements, however, the initiative

and development work are provided by the municipality and the facility is dedicated to serve the needs of the municipality. With this exception acknowledged, city sponsorship and city ownership are used interchangeably and are contrasted with the straight service deal proposed by TBS.)

The key elements of successful project implementation are:

- Securing a long-term waste delivery guarantee.
- Securing a long-term energy purchase guarantee.
- Securing a facility site within economic transport distance of the energy buyer.
- Residual disposal site.
- Obtaining financing.
- Procuring a system.
- Maintaining project momentum.

The remainder of this chapter discusses these key elements in the context of a Mobile resource recovery project.

WASTE DELIVERY GUARANTEE

Under either public or private ownership, the City of Mobile will have to guarantee delivery of a specified annual amount of solid waste over the life of the project. The City can further expect that it will pay a disposal fee for that guaranteed tonnage whether or not it is delivered. This put-or-pay arrangement is essential to ensure revenues to the project both in the form of tip fees themselves and revenue from the energy produced.

If the City is the project sponsor and uses revenue bond financing, it is very likely that an investment banker will require the City to be the ultimate guarantor of all of the necessary waste [i.e., it guarantees to deliver the waste that it collects, and there could be requirements by an investment banker that the City provide backup provisions (e.g., waste flow ordinances) to ensure that an adequate amount of waste is delivered by private collectors, if such waste is essential to the success of the project.] Because the quantity of publicly collected waste in Mobile is

insufficient to meet the energy requirements of Degussa, the City as project sponsor would have to secure waste from private haulers. As a minimum the City will have to negotiate contracts with the major haulers.

TBS as the project sponsor will require a binding long-term contract with the City for the waste it collects. It is understood that TBS has already received letters of intent from the two largest private haulers in the area. Based on available information, it appears that its agreements with the private haulers can satisfy the financing requirements for the TBS project.

It is not certain whether the City of Mobile can legally bind succeeding administrations with a long-term delivery guarantee of waste collected by Mobile. If the City cannot do this, a possible solution is to create a local resource recovery authority under recently enacted Alabama law. Act 80-278 permits such an authority to "...acquire, construct, own, lease, operate or enter into contracts for the operation of solid waste disposal facilities and resource recovery facilities." The process for creating such an authority under Act 80-278 is relatively simple.

ENERGY PURCHASE GUARANTEE

The energy buyer is a critical element of a waste-to-energy project because energy sales provide the major revenues to the project. If revenue bond financing is used, it will be necessary for the energy buyer to enter into a long-term energy purchase agreement, typically on a take-or-pay basis, to ensure that project energy revenues are secured. It is reported by TBS that their agreement with Degussa will meet this financing requirement.

Should the City decide to sponsor the project, it would have to negotiate such an agreement with Degussa or attempt to find another viable buyer. It is unknown whether or not Degussa would be willing to substitute the City for TBS in its purchase agreement. Also, there may be aspects of the agreement that the City might find unsatisfactory and wish to renegotiate.

FACILITY SITE

If the City decides to sponsor an energy recovery project, it will have to acquire a site for the facility that will be within economic steam transport of Degussa, or some other energy buyer. In addition, the City will be responsible for supplying environmental information to the Alabama Department of Health in order to obtain the necessary permits for construction of the facility on the site it acquires.

TBS claims to have a purchase option on a site within economic steam transport of Degussa. If the City accepts the TBS proposal, the company will be responsible for obtaining the necessary environmental permits.

RESIDUAL DISPOSAL SITE

If the City were to sponsor an energy recovery project, it could use Chastang landfill for residue disposal. Because of the greatly reduced volume that would have to be filled and the greater compaction possible, the useful life of the landfill could be extended for an estimated 30 to 40 years.

TBS reports that it has made arrangements with the County for use of its landfills for disposal of residue and any processible waste that may have to be bypassed. Thus, it appears that a residue disposal facility will be available irrespective of who undertakes the energy recovery project. Should the City reach an agreement with TBS, it may wish in the future to make available its landfill as a residual disposal site, since its landfill has a longer useful life than the County landfills.

FINANCING

If the City were to sponsor and own the project, it probably would finance it through the issuance of revenue bonds, as discussed in Chapter 5. While payment of the annual debt service is supported by revenues from energy sales and disposal charges, a major concern of the investment banker is how debt service will be paid in case a force majeure or other event causes revenues to fall below that sufficient to cover such payments.

Creation of a debt reserve fund is one source of security. However, many investment bankers seek additional security in order to make the sale of bonds more attractive to potential buyers. Frequently this desire for additional security has caused the investment banker to turn to the public sponsor to provide it. Thus, if the City undertakes to sponsor and own the project, it will have to make important decisions on how to provide security to the bond buyer that principle and interest will be paid in the event project revenues fall below anticipated levels.

In the case of private ownership, where revenue bond financing is involved, the problem of providing security to the bond buyers falls on the private owner. This is because the private owner is contractually responsible for the payment of principal and interest.

While it is not known how TBS intends to finance the project, the proposal is attractive because TBS assumes the financing risks, rather than the City. Because TBS is the responsible entity, the City need not withhold cooperation in the event that TBS decides that the best method of financing would involve use of revenue bonds.

PROCUREMENT

Under public sponsorship resource recovery systems are typically procured by one of the three following methods:

- An architectural and engineering (A&E) contract is for facility design and equipment selection, preparation of competitive bid specifications, construction supervision, and, possibly, facility shakedown. Construction and equipment installation are competitively bid. The owner takes over the facility upon physical completion. Full-scale operation and, possibly, shakedown are the responsibility of the owner.

- A turnkey approach, is where a single entity performs the services that would otherwise be provided by an A&E, plus construction, testing, and shakedown of the system. Final payment is made to the turnkey contractor following successful shakedown and acceptance by the sponsor. Full-scale operation is the responsibility of the owner.

- A full-service approach is where a single contractor performs all functions of a turnkey contractor and is responsible for full-scale operation of the facility generally ranging from 5 to 20 years.

A full-service procurement is designed to permit the maximum transfer of technical risks from a project sponsor to the contractor. While a full-service contractor assumes major financial risks for technical failure of his system to meet performance guarantees over the life of the operating contract, such financial exposure has limits. As a result, there will be a residual financial exposure to the public sponsor.

Municipalities are often constrained in the procurement approach they may take because of:

- Low-bid requirements -- laws common to local government that force acceptance of the lowest bid instead of allowing a negotiated procurement.

- Split-bid requirements -- laws that require separate bids for the various components of public construction projects.

Because allocation of project risks is closely tied to the procurement approach that is used and because risk allocation is critical to obtaining revenue bond financing, limitations placed on municipalities regarding procurement can be an obstacle to successful project implementation.

Under Act 80-278, a resource recovery authority would not be so constrained and would be free to select the procurement approach and contractor that is most appropriate.

Whether a local authority or the City undertakes project sponsorship, considerable time and money will be required to prepare bid documents, evaluate proposals, and successfully negotiate a contract with the selected vendor. The City (local authority) also must decide before issuing a procurement document whether or not it wants to procure on a full-service basis, and if so, whether it wants to own the facility. Concurrent with the procurement effort the City (local authority) would have to obtain a sales agreement with Degussa, acquire a facility site, make long-term arrangements for delivery of refuse by private haulers, and develop a specific financing plan including a flow of funds. These additional tasks

must be accomplished in a timely manner, since their results should be incorporated into a procurement document.

TBS essentially has done all the things that the City (local authority) would have to do to procure and finance a project. It is prepared to assume all technical risks associated with a waste-to-energy system, and under the terms of its proposal appears to be accepting force majeure as a normal business risk. It is understood that TBS has evaluated systems supplied by Environmental Control Products and by Consumat Systems, including the operational experience of those two companies, prior to selecting Consumat for system supplier and facility operator.

PROJECT MOMENTUM

If the City wishes to proceed with implementation of an energy recovery project, it is critical that it organize so that timely decisions can be made. It should appoint a lead person with responsibility and authority to maintain momentum, and a firm schedule for getting the project to financing and the start of construction. This is true whether it decides to sponsor the project or decides to seriously negotiate with TBS. Mobile should respond to the TBS proposal with a decision on whether or not to undertake final negotiations with the company once all the information requested of it by the City (see Chapter 7) has been supplied. It should be recognized that companies like TBS, including firms offering to be full-service contractors, may lack the substantial financial resources necessary to withstand protracted periods of public indecision. Signficiant delays may cause loss of interest by Degussa and the private haulers, and could jeopardize the financing of the project.

Experience with other projects around the country indicates that a less than full commitment to undertake an energy recovery project jeopardizes the success of the project. Thus, it is important that Mobile make a timely decision on whether or not it truly wants to implement an energy recovery project. If it prefers to continue to dispose of waste through landfilling, it should make such decision soon. Failure to do so may result in wasting limited resources of the City, of TBS, and of the firm chosen to supply the system and operate the facility. In addition, the

capacity of the energy recovery vendors is not unlimited. An increasing number of local governments are soliciting proposals for energy recovery projects and vendors are choosing the most serious projects to which they will respond.

CHAPTER 7.
CONCLUSIONS/NEXT STEPS

In the preceding chapters it has become clear that the TBS proposal may be attractive to the City of Mobile:

- In Chapter 3, it was shown that TBS has negotiated an energy purchase agreement with a company that provides the best market for energy from waste in the Mobile area.
- In Chapter 4, it was shown that TBS has selected a technology and system configuration that is most appropriate for the market and the waste stream.
- In Chapter 5, it was shown that the cost of disposal offered by TBS is competitive with the cost of a publicly sponsored project and considerably more cost-effective than continued reliance on landfilling.
- In Chapter 6, it was shown that public sponsorship, while facilitated by the creation of a special authority, may be more difficult and less advantageous than private sponsorship and ownership as proposed by TBS.

Thus, it is concluded that, if TBS can prove to the City's satisfaction that it is capable of developing and actually implementing its proposed project, the City should negotiate a waste disposal agreement for such services.* On the other hand, if the City finds during negotiations with TBS that there are one or more reasons why TBS may fail to successfully implement the project, the City should not commit its waste stream. The reason for this is that the City jeopardizes, or at least unnecessarily delays, the chance to implement an attractive resource recovery project itself.

The major purpose of this chapter is to provide a guide to the City in evaluating whether TBS can successfully implement its proposed project. Basically, this guide consists of a list of conditions that should exist for a project to be successful, and a requirement that disclosures of TBS' arrangements must be sufficient for the City to reasonably assure

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* Whereas the City may not have the legal authority to negotiate such a long-term agreement, a specially created resource recovery authority likely would.

itself that the essential conditions for success exist. Care must be taken, however, that information requests by the City and the project monitoring procedure do not become so cumbersome and time-consuming that TBS is precluded from meeting its schedule. Unnecessary delay could cause the project to fail.

To assist the City in reaching a decision on how to respond to the TBS proposal, EPA through its technical assistance contractor, submitted an interim report in May 1981. The conclusion of that interim report was that after preliminary investigations, the TBS proposal appeared advantageous to Mobile but that the City should seek confirmation that basic conditions for project success existed. As a result, the City requested that TBS supply it with information identified in the interim report. Subsequent to that request, TBS provided a major portion of this information. The extent to which TBS' submittals are complete and satisfactory to the City is summarized in the column next to the list of conditions given below.

Evidence Must be Presented that the Following Conditions Exist:	Response through August 1981
1. Energy Purchase Agreement between TBS and Degussa:	Unsigned agreement was received by EPA's technical assistance contractor under a nondisclosure agreement
- signed by persons authorized to bind Degussa	
- binds for term of bonds	All minimum conditions are present
- contains fair price and escalation agreements.	
- requires Degussa to take or pay for minimum amount of steam	
- contains reasonable specifications on quality and delivery	All minimum conditions are present
- contains reasonable default and termination provisions.	

2. Waste Supply Agreements between TBS and other suppliers who, together with the City of Mobile, will provide the 250 TPD_7 of waste required by the project: - signed by persons authorized to bind the firm or municipality - binding for term of bonds - contain fair tip fees and escalation arrangements - require private hauler or municipality to supply minimum amount of waste or pay a penalty (put or pay) - contain reasonable specifications for waste characteristics and delivery schedules - contain reasonable default and termination provisions.	Letters of interest from BFI and Mobile County submitted. Firm agreements pending active negotiations with the City.
3. System Supply and Operations Agreement between TBS and system vendor. - signed by person authorized to bind vendor - specifies performance standards for plant - binds operations and maintenance for specific period - contains reasonable plant cost, operating fees, and profit sharing and escalation arrangements - requires vendor to assume all risks of plant design and operation and to rectify any malfunction at no charge.	Letter of Intent signed by TBS. Budgets being revised; further engineering work and final contract pending active negotiations with the City.

4. Financing Plan:	
- specifies type of financing, risk disclosure, safeguards, potential markets, probable rate, federal tax incentives, and availability of supplemental funds should project require more.	Financing plan being finalized by investment company retained by TBS.
5. Residue and Bypass Landfill:	
- evidence that TBS has long-term access to a permitted sanitary landfill or has a commitment from a landfill owner to dispose of plant residue and bypass for a reasonable number of years.	Mobile County has indicated willingness for TBS to use one of its landfills as a residue site.
6. Compliance with Regulatory Agencies (federal, state, and local)	
- evidence that TBS has identified all relevant regulatory requirements and will be able to satisfy them.	Not submitted.
7. Complete Disposal Service	
- commitment by TBS that it will contract with the City to accept the City's waste whether or not the proposed resource recovery plant operates at the price agreed upon.	Not submitted.
8. Schedule:	
- a realistic, attainable schedule showing dates for: start of final design, transfer of title of facility site to TBS, all permits obtained, start of construction, completion of construction, completion of startup, and start of full-scale operations.	Incomplete.

- a commitment by TBS as to a date certain from the time it executes a waste disposal agreement with the City that it will begin accepting all wastes delivered by the City.	Not submitted.

9. Project Description:

- a description of the proposed system in terms of site layout, civil works, major equipment, performance date, and normal and emergency operating procedures.	Not submitted.

A resource recovery project requires a great deal of effort, coordination, and time. One key measure of the success of the project will be for Mobile to insist on a date certain for acceptance of solid waste at the facility of TBS plus other major milestone accomplishments, such as a start of construction and beginning of startup and testing activities. Failure to adhere to the date certain should be cause for the City to terminate its agreement with TBS.